

AMENDMENTS

In the Claims:

Please amend the claims as indicated hereafter.

1. (Currently Amended) A computer system capable of performing backward error recovery, comprising:
 - a memory unit having a plurality of memory locations; and
 - a memory controller configured to maintain a checksum in one of said memory locations, said memory controller further configured to receive a plurality of requests to update said checksum with a plurality of combined data values, said memory controller configured to combine said checksum to each of said combined data values and to store each of said combined data values, at least one of said combined data values representing a result of combining a first data value with a second data value, wherein said first data value and said second data value are stored at different times in the same memory location of a memory unit, said memory controller further configured to retrieve a plurality of said combined data values, including said one combined data value, in response to a data error and to recover a previous state of a particular memory location by combining each of said retrieved data values to said checksum.
2. (Original) The system of claim 1, wherein said memory controller is configured to combine each of said retrieved data values to said checksum by exclusively oring each of said retrieved data values to said checksum.

3. (Currently Amended) The system of claim 1, wherein each of said stored data values represents an exclusive or result between a first data value and a second data value that is replaced in memory by said first data value.

4. (Currently Amended) The system of claim 1, further comprising a first stack and a second stack, wherein said memory controller is configured to determine which protection domains are associated with said combined data values, and wherein said memory controller, in storing said combined data values, is configured to store in said first stack each of said combined data values determined by said memory controller to be associated with a first protection domain and to store in said second stack each of said combined data values determined by said memory controller to be associated with a second protection domain.

5. (Original) The system of claim 4, wherein said memory controller is configured to identify one of said protection domains in response to said data error and to select one of said stacks based on which of said protection domains is identified by said memory controller, and wherein each of said retrieved data values is retrieved from said selected stack.

6. (Currently Amended) The system of claim 5, wherein said memory controller is configured to correlate each of said stored data values with a memory controller identifier identifying another memory controller that transmitted the correlated data value.

7. (Original) The system of claim 6, wherein each of said retrieved data values is correlated with a memory controller identifier identifying a failed memory controller.

8. (Original) The system of claim 1, wherein said memory controller is configured to identify a particular memory location in response to said data error and to identify which of said data values to retrieve in response to said data error based on which of said data values are associated with said particular memory location.

9. (Original) The system of claim 8, wherein each of said retrieved data values represents an exclusive or result between a first data value and a second data value that is replaced in said particular memory location by said first data value.

10. (Original) A computer system capable of performing backward error recovery, comprising:

a plurality of memory units, each of said memory units having a plurality of memory locations; and

a plurality of memory controllers configured to store to and retrieve from said memory units, one of said memory controllers configured to maintain, in a checksum memory location, a checksum of a checksum set, the other of said memory controllers configured to receive a plurality of write requests for writing to said checksum set, said other memory controllers, for each of said write requests, configured to store a first data value in one of said memory locations, to retrieve a second data value from said one memory location, to combine said first data value with said second data value thereby forming a combined value, and to transmit said combined value to said one memory controller,

wherein said one memory controller is configured to update said checksum memory location with a plurality of combined values formed by said other memory controllers and to store each of said plurality of combined values, said one memory controller further configured

to retrieve said stored plurality of combined values in response to a data error and to combine said retrieved combined values with said checksum.

11. (Original) The system of claim 10, wherein said memory locations within said memory units are assigned to different protection domains, and wherein said one memory controller is configured to determine, in a plurality of determinations, which of said protection domains is associated with each of said combined values, said memory controller further configured to store said plurality of combined values associated with different protection domains in different stacks based on said determinations.

12. (Original) The system of claim 10, wherein said one memory controller is configured to correlate each said plurality of combined values with an identifier that identifies the memory controller that transmitted the correlated combined value to said one memory controller.

13. (Original) The system of claim 12, wherein each of said values retrieved by said one memory controller is correlated with the same identifier, said same identifier identifying a failed memory controller.

14. (Original) The system of claim 10, wherein said memory locations within said memory units are assigned to different protection domains, and wherein said one memory controller is further configured to identify which of said protection domains is associated with said data error and to retrieve said plurality of retrieved combined values based on said identified protection domain.

15. (Original) The system of claim 14, wherein each of said retrieved combined values is associated with said identified protection domain.

16. (Original) A method for performing backward error recovery, comprising the steps of:

storing a plurality of data values within a checksum set to a plurality of memory locations, said checksum set including a checksum value and a plurality of non-checksum values;

updating one of said memory locations with a first value;

combining said first value to a second value to form a combined value, said second value stored in said one memory location prior to said updating step;

updating said checksum value with said combined value;

storing said combined value;

retrieving said combined value in response to a data error;

combining said value retrieved in said retrieving step to said checksum value; and

recovering a previous state of said one memory location based on said combining said retrieved value step.

17. (Original) The method of claim 16, wherein said combining said first value step includes the step of exclusively oring said first value with said second value, and wherein said combining said retrieved value step includes the step of exclusively oring said checksum value to said retrieved value.

18. (Original) The method of claim 16, further comprising the step of associating said data error with a particular protection domain, wherein said retrieving step is based on said associating step.

19. (Original) The method of claim 16, further comprising the step of assigning to a respective protection domain each of said memory locations that is storing one of said non-checksum values, wherein said storing said combined values step is based on which protection domain is assigned to said one memory location.

20. (Original) The method of claim 19, further comprising the step of selecting a stack based on which protection domain is assigned to said one memory location, wherein said storing said combined value step includes the step of storing said combined value to said selected stack based on said selecting step.

21. (Original) A method for performing backward error recovery, comprising the steps of:

storing a plurality of data values within a checksum set to a plurality of memory locations, said checksum set including a checksum value and a plurality of non-checksum values;

assigning said memory locations to different protection domains;

storing new non-checksum values to said memory locations;

for each of said new non-checksum values stored to one of said memory locations, combining said new non-checksum value with a value previously stored in said one memory location thereby forming a combined value;

updating said checksum value with each combined value formed via said combining step;
storing into memory each combined value formed via said combining step;
detecting a data error;
identifying a protection domain associated with said data error;
selecting a plurality of combined values formed in said combining step based on said identifying step;
combining each of said selected combined values with said checksum value in response to said data error; and
recovering a previous state of one of said memory locations based on said combining each of said selected combined values step.

22. (Original) The method of claim 21, wherein said combining steps are exclusive oring steps.

23. (Original) The method of claim 21, further comprising the step of correlating each said value stored in said storing step with a respective one of said protection domains, wherein each value selected in said selecting step is correlated, via said correlating step, with said identified protection domain.

24. (Original) The method of claim 21, further comprising the step of respectively correlating each said value stored in said storing step with one of said protection domains, wherein said storing step is based on said correlating step.

25. (Original) The method of claim 24, wherein said storing step comprises the step of storing into the same stack each value correlated, via said correlating step, with the same protection domain.

26. (New) The system of claim 1, wherein said one combined data value is formed by exclusively oring said first and second data values.

27. (New) The system of claim 1, wherein said first data value is used to overwrite said second data value at said memory location.

28. (New) The system of claim 1, wherein said memory controller is further configured to correlate said one combined value with a memory location identifier that identifies said memory location.

29. (New) The system of claim 28, wherein said memory controller is configured to perform backward error recovery for a specified protection domain, to determine whether said one combined value is associated with said specified protection domain based on said memory location identifier, and to combine said one combined value with said checksum during said backward error recovery for said specified protection domain if said one combined value is associated with said specified protection domain.

30. (New) The system of claim 28, wherein said memory controller is further configured to combine said one combined value with said checksum based on said memory location identifier.

31. (New) The system of claim 28, wherein said memory controller is further configured to store said one combined value and said memory location identifier to a stack.

32. (New) The system of claim 31, wherein said stack is associated with a single protection domain.

33. (New) The system of claim 31, wherein said memory controller is configured to perform backward error recovery in response to said data error and to pull said one combined value and said memory location identifier from said stack to perform said backward error recovery in response to said data error.

34. (New) The system of claim 10, wherein said first data value is combined with said second data value via an exclusive or operation to form said combined value.

35. (New) A method for performing backward error recovery, comprising the steps of:

- maintaining a checksum;
- storing a first data value in a memory location;
- storing a second data value in said memory location in response to a write request;
- combining said first data value and said second data value to form a combined data value in response to said write request;
- combining said combined data value to said checksum in response to said write request;
- storing said combined data value; and
- recovering a previous state of a particular memory location in response to a data error,

said recovering step comprising the steps of retrieving said combined data value and combining said combined data value to said checksum in response to said data error.

36. (New) The method of claim 35, wherein said combining said combined data value to said checksum in response to said data error step comprises the step of exclusively oring said combined data value and said checksum.

37. (New) The method of claim 35, further comprising the steps of:

- assigning said memory location to a protection domain; and
- correlating said data error with said protection domain,

wherein said recovering step comprises the step of selecting, based on said assigning and correlating steps, said combined data value to be combined with said checksum.

38. (New) A method for performing backward error recovery, comprising the steps of:
maintaining a checksum;
updating said checksum with a plurality of data values in response to write requests;
correlating said data values with a plurality of protection domains;
detecting a data error associated with one of said protection domains;
determining which of said data values are correlated with said one protection domain in response to said data error; and
updating, in response to said data error, said checksum with each of said data values determined by said determining step to be correlated with said one protection domain.

39. (New) The method of claim 38, further comprising the steps of:
storing, to a stack, said data values determined to be correlated with said one protection domain; and
retrieving, from said stack in response to said data error, each of said data values determined to be correlated with said one protection domain.

40. (New) The method of claim 38, wherein at least one of said data values determined to be correlated with said one protection domain represents a result of combining a first data value with a second data value, wherein said method further comprises the step of storing said first and second data values at the same memory location at different times, and wherein said updating step is based on said storing steps.